UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/679,719	10/06/2003	Susan G. Yan	8540G-000169	2872

27572 7590 10/12/2006

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303

EXAMINER	
MCCLELLAND, KIMBERLY KEIL	

ART UNIT	PAPER NUMBER
1734	

DATE MAILED: 10/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/679,719	**Applicant(s)** YAN ET AL.	
	Examiner Kimberly K. McClelland	**Art Unit** 1734	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4 and 8-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4 and 8-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4, 9, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Wilson et al. "Thin-film catalyst layers for polymer electrolyte fuel cell electrodes" (hereafter "Wilson") in view of R.B. Moore et al. "Procedure for Preparing Solution-Cast Perfluorosulfonate Ionomer Film and Membranes" (hereafter "Moore") and Wilson '777 (US Patent No. 5,234,777) and Debe et al. (US Patent No. 6,432,571) and Afzali-Ardakani et al. (U.S. Patent No. 5,591,285).

Regarding claims 1, Wilson discloses a method of making a membrane electrode assembly (MEA) comprising: forming a slurry including an ionomer (Nafion), a carbon electrically conductive material, a Pt catalyst and a glycerol[1] solvent mixed with water (Section 3.1, first paragraph); applying the slurry onto a substrate (Teflon (tetrafluoroethylene/ polytetrafluoroethylene) blank in Fig. 1) which has sufficient structural integrity to be reusable (See Figure 1 and protocol step 4 on page 3); drying or removing the applied slurry in protocol step 5 on page 3 to form a film; bonding the film to the membrane (See Figure 1, step d); and peeling the Teflon blank from the film. (Figure 1.)

Moore discloses using solvents which have lower boiling points and, as set forth in Wilson '777, these solvents yield equivalent properties to glycerol solvents, but at lower process temperatures. (See p. 2549 of Moore; Col. 6, lines 50-66 of Wilson '777.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a solvent having a lower the boiling point, such as within the range of 100°C and 200°C, because Moore teaches the feasibility of using a solvent having a lower boiling point and, as stated in Wilson '777, the use of using lower boiling point solvents results in lower processing temperature.

Wilson is silent as to specific thickness values for the Teflon substrate. However, Debe et al. discloses transferring a catalyst subassembly, including using a Teflon substrate having a thickness of 50 micrometers (column 23, lines 50-54). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the thickness value taught by Debe et al. with the Teflon blank disclosed by Wilson. The motivation would have been to allow for easy peeling of the Teflon substrate from the catalyst subassembly (Debe et al.; Col. 23, lines 62-65).

Wilson does not disclose a specific porosity value for the Teflon substrate. However, Afzali-Ardakani et al. discloses using a nonporous Teflon carrier substrate, instead of a porous Teflon carrier substrate for transferring composites (column 14, lines 52-62). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the preferred nonporous Teflon substrate of Afzali-Ardakani et al. with the Teflon blank disclosed by Wilson. The motivation for using a

---

[1] Glycerol has a boiling point 290°C.

nonporous Teflon carrier substrate would have been to prevent adversely changing the electrical properties of the composite (column 14, lines 52-62).

Regarding claim 4, the substrate blank is Teflon and Teflon meets the criteria of having a suitable surface energy. Furthermore, it is known that Teflon has a low surface energy within the claimed range.

Regarding claim 9, hot pressing of the catalyst/blank onto the membrane is performed at temperatures above the glass transition temperature of Nafion, which is 105°C. (Protocol step 5, page 3.)

Regarding claim 11, the electrically conductive material is carbon and the catalyst is platinum.

Regarding claim 12, the ionically conductive material is Nafion which is a trade name for a pefluorosulfonate ionomer.

3. Claims 2, 13, and 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson in view of Moore, Wilson '777, Debe et al., and Afzali-Ardakani et al. as applied to claim 1 above, and further in view of Tou (U.S. Patent No. 5,518,831).

Wilson does not disclose the step is of cleaning the substrate after peeling the substrate from the film with a solvent. Wilson teaches that prior to using the blank upon which the catalyst film is formed, the substrate is first cleaned.

Tou teaches that he substrate surface should be clean (free from contamination). It can be cleaned by washing with an alcohol solvent such as isopropanol or0 methanol prior to application of the polymer/catalyst layer. Thus removing dirt, contaminants, and additives, including wetting agents from the surface. (See paragraph bridging columns 7 and 8).

The motivation for cleaning the substrate surface with a solvent such as methanol prior to using the substrate is that it provides a clean surface upon which the catalyst layer can be deposited. Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made based on the teachings of Tou to modify the teachings of Wilson by cleaning the substrate prior to use or reuse since it would have provided a clean surface upon which the catalyst layer would have been deposited on.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson in view of Moore, Wilson '777, and Debe et al. as applied to claim 1 above, further in view of Sompalli et al. (US Patent No. 6,524,736).

Wilson discloses using a glycerol and water solvent mixture, but it would have been obvious to one having ordinary skill in the art at the time the invention was made that additional solvents could be used as solvents and their properties are known to an artisan. Moore and Wilson '777 disclose dimethyl sulfoxide as a possible solvent. Moore also suggests ethylene glycol as a choice. As set forth in Moore, the artisan appreciates advantages exist for using different solvents. Moore suggests dimethyl sulfoxide (DMSO) and ethanol as alternatives to glycerol. Sompalli discloses that well known alternatives to ethanol is n-butanol. (Col. 8, lines 21-65.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made that the solvents disclosed in Moore are not the only solvents with a boiling point lower than 200°C which can be used. It is within the purview of the artisan to using different solvents, such as n-butanol which is disclosed in Sompalli.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson in view of Moore, Wilson '777, Debe et al., and Afzali-Ardakani et al. as applied to claim 1 above, and further in view of Grot (U.S. patent No. 5,330,860).

Wilson in view of Moore, Wilson '777, and Debe et al. does not disclose how the material is coated onto the substrate.

Grot teaches using transfer catalyzation wherein an electrode ink comprising a platinum catalyst on a carbon supporting material is printed on a suitable substrate, such as TEFLON.RTM. or paper, it has been possible to form electrodes containing as little as 0.2 mgm/cm.sup.2 of precious metal. In particular, these electrodes, which are essentially decals formed from a supported platinum catalyst electrode ink are painted or sprayed on the substrate and then dried and hot pressed onto ion exchange membranes. This so-called decal process of applying the electrode ink to the surface of the membrane has been successful but involves the arduous process steps of forming the electrode decal and then transferring it to the membrane. (See paragraph bridging columns 2 and 3).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to coat the substrate in Wilson by printing or spraying the coating onto the substrate as taught by Grot '860 because it would have provided efficient and effective process for forming the catalyst layer onto the substrate to form a film.

Response to Arguments

6. Applicant's arguments with respect to claims 1, 2,4, and 8-14 have been considered but are moot in view of the new ground(s) of rejection.

7. With respect to applicant's argument against the Teflon substrate of Debe et al. as not meeting the limitations disclosed in claim 1, examiner disagrees. Applicant argues the sheet of Debe is performing an entirely different function. However, Debe clearly teaches that it is known in the lamination art to use Teflon sheets with a 50 micrometer thickness as substrates while manufacturing catalyst subassemblies. Wilson discloses the reusable polymeric substrate of polytetrafluoroethylene on which a slurry is formed. It is the combination od Debe and Wilson which yields the desired thickness disclosed in claim 1. The motivation to combine the two would have been to allow for easy peeling of the Teflon substrate from the catalyst subassembly (Debe et al.; Col. 23, lines 62-65). One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

8. Applicant continues to argue that the electrode backing layers are porous. However, examiner asserts that the Teflon substrates, not the electrode backing layers,

are used in combination with Wilson to reject independent claim 1. Consequently, Debe is not found to teach away from the current invention.

9. With respect to applicant's argument that the Teflon blank disclosed by Wilson is not reusable, examiner disagrees. When modified by the teachings disclosed in Debe et al., the Teflon blank of Wilson meets the claimed limitations of the substrate disclosed in claim 1. Since the prior art teaches using the same type of substrate as the applicant (*i.e.* polytetrafluoroethylene) with the same thickness (*i.e.* 50 micrometers), and there is nothing in the claims which distinguishes applicant's substrate from the one used in the teachings of the prior art, it is the examiner's position that this feature is shown in the prior art applied. Applicant specifically lists polytetrafluoroethylene as an option for the material of the substrate. Since the material used as the modified substrate in Wilson is the same applicant uses, it is inherently reusable as set forth in the rejection using Wilson in view of Moore, Wilson '777, and Debe et al.

10. As to applicant's assertion that the there is no disclosure in these references of non-porous substrates, examiner disagrees. "Non-porous" is a relative term of degree, and holds little distinction without a porosity reference value disclosed in the claimed subject matter. The Teflon disclosed by the prior art is a relatively nonporous material. If applicant believes the term "non-porous" establishes patentability, examiner encourages a porosity reference value to be included in the claimed subject matter.

11. With respect to applicant's argument that the presently claimed invention does not require application of a mold release, it is noted that the features upon which applicant relies (i.e., absence of a mold release) are not recited in the rejected claim(s).

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

12. Consequently, claims 1, 2, 4, and 8-14 remain rejected under Wilson in view of various secondary references.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly K. McClelland whose telephone number is (571) 272-2372. The examiner can normally be reached on 8:00 a.m.-5 p.m. Mon-Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris A. Fiorilla can be reached on (571)272-1187. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kim McClelland

KKM

CURTIS MAYES
PRIMARY EXAMINER